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## 2.6.2 Monopole Antenna

The monopole antenna, shown in Figure 2.11, results from applying the image theory to the dipole. According to this theory, if a conducting plane is placed below a single element of length  $L/2$  carrying a current, then the combination of the element and its image acts identically to a dipole of length  $L$  except that the radiation occurs only in the space above the plane as discussed by Saunders [8].

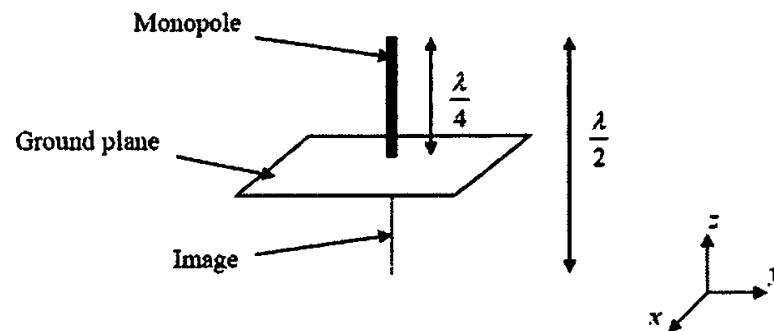


Figure 2.11 Monopole Antenna

For this type of antenna, the directivity is doubled and the radiation resistance is halved when compared to the dipole. Thus, a half wave dipole can be approximated by a quarter wave monopole ( $L/2 = \lambda/4$ ). The monopole is very useful in mobile antennas where the conducting plane can be the car body or the handset case. The typical gain for the quarter wavelength monopole is 2-6dB and it has a bandwidth of about 10%. Its radiation resistance is  $36.5\Omega$  and its directivity is 3.28 (5.16dB) [4]. The radiation pattern for the monopole is shown below in Figure 2.12.

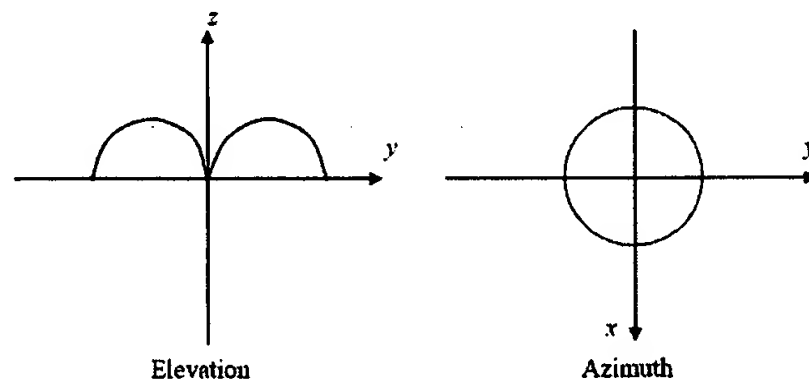


Figure 2.12 Radiation pattern for the Monopole Antenna